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(54) Abstract Title
Upright-type vacuum cleaner with removable cyclone dust collecting means and filter

(57) An upright-type vacuum cleaner includes a cleaner body 10, motor chamber 12, suction brush 20, cyclone dust collecting means 30, and filtering means 40. The cyclone dust collecting means 30 is removably disposed in a dust collecting chamber 11 in the cleaner body. The suction brush draws air and contaminants from a cleaning surface into the cleaner body. The air follows the intake duct 14 to the dust collecting chamber inlet port 11a and then enters the cyclone body 31 via channel 36. The cyclone dust collecting means induces the air and contaminants into a vortex to separate by centrifugal force large particle contaminants from the air and to collect the contaminants. The cyclone dust collecting means has a centrifuging portion 32 from where contaminants are discharged to a dust receptacle 33 via a slot 32c. The centrifuged air is then discharged from the cyclone dust collecting means via channel 37 and leaves the dust collecting chamber via port 11b, from where it passes through a filter 41 further reducing fine contaminants entrained in the air.

FIG.1

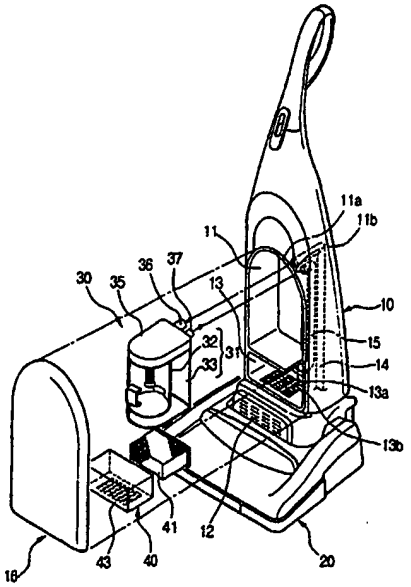

FIG.2

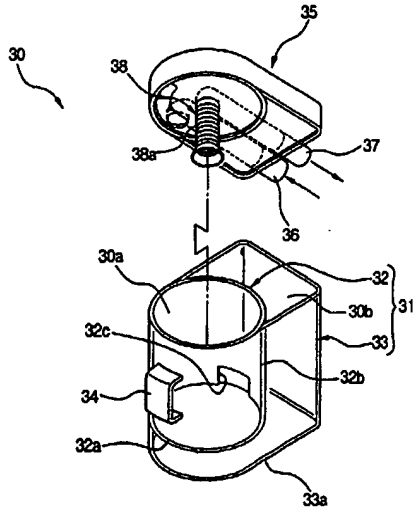

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FIG. 1

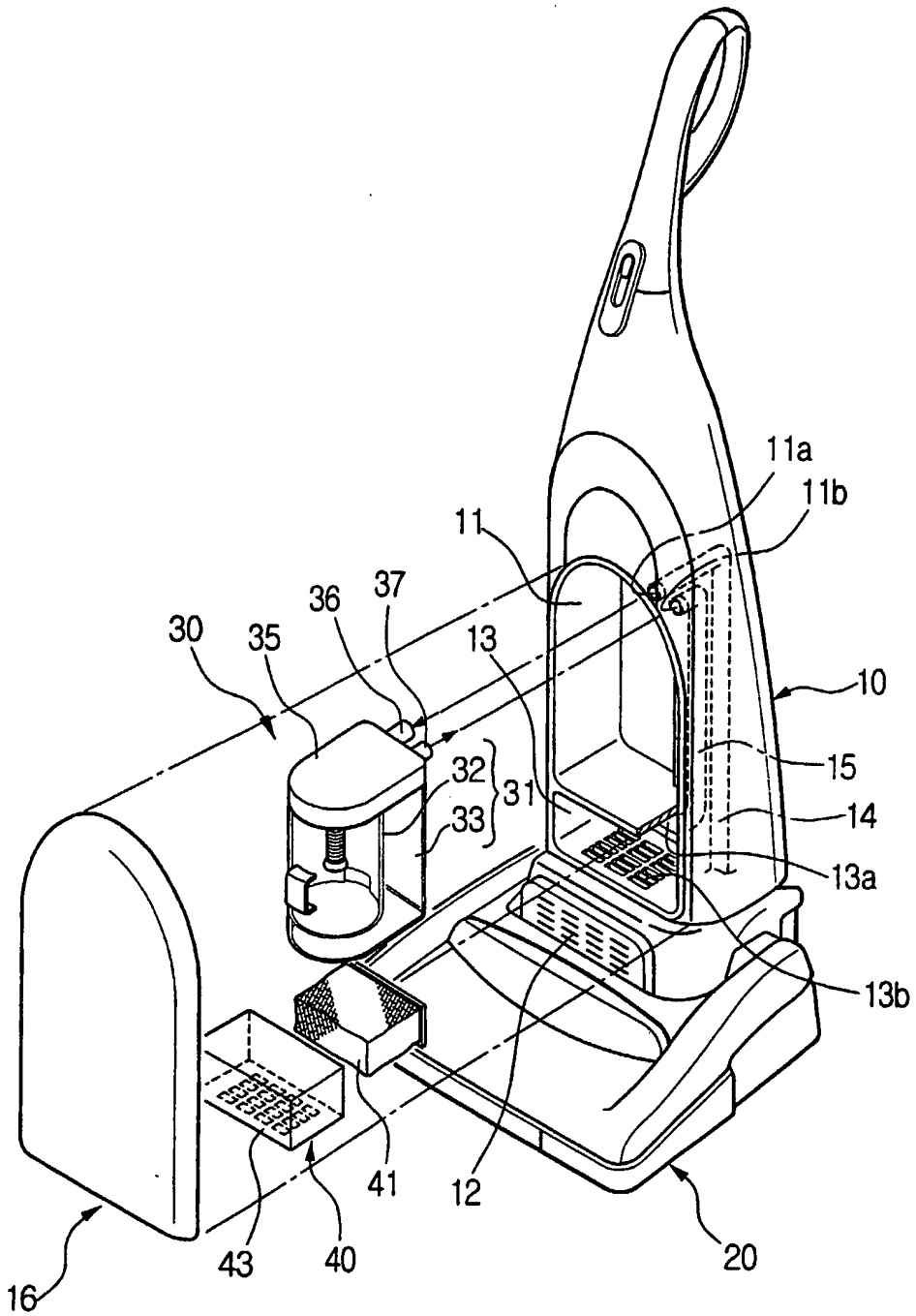


FIG.2

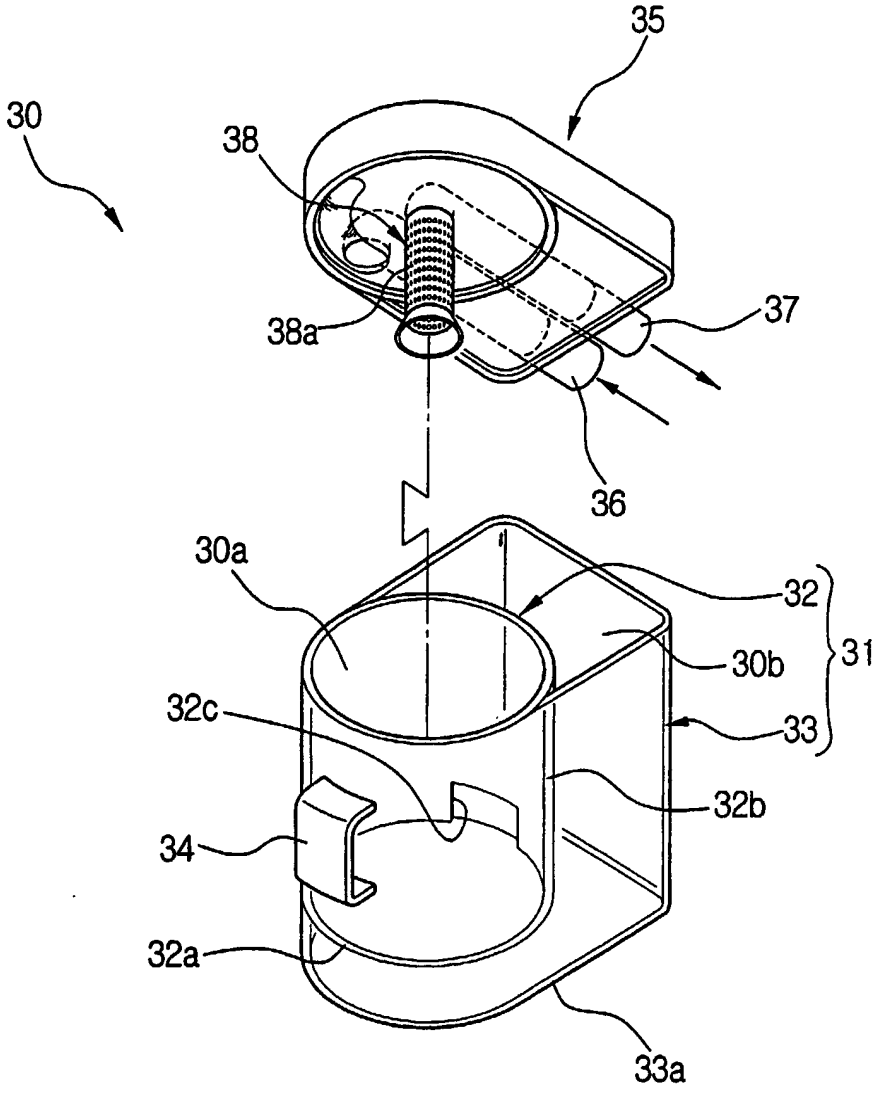
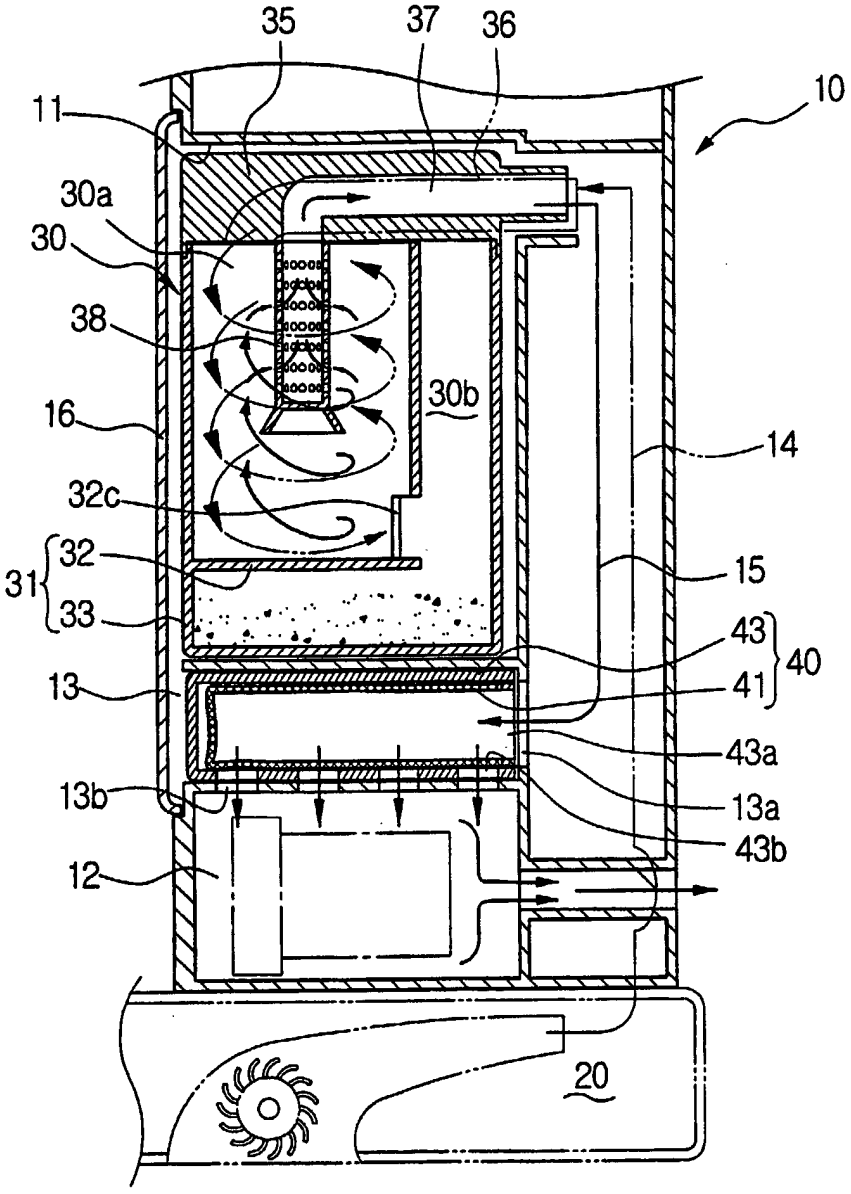


FIG.3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UPRIGHT-TYPE VACUUM CLEANER

This invention relates to an upright-type vacuum cleaner and, more particularly, to an upright-type vacuum cleaner having cyclone dust collecting apparatus which uses centrifugal force to collect contaminants from the air that is drawn into the vacuum cleaner.

Generally, an upright-type vacuum cleaner includes a suction brush that is movably connected to a cleaner body. The suction brush moves along a cleaning surface during the cleaning process. The cleaner body includes a dust collecting chamber having a detachable dust filter disposed therein, and a motor operating chamber having a motor for generating a suction force. When the motor operates, it generates a strong suction force at the suction brush. Accordingly, contaminants, such as dust or dirt, on the cleaning surface are drawn in together with air into the cleaner body. The contaminants entrained in the air are filtered through the dust filter that is disposed in the dust collecting chamber of the cleaner body and the clean air is discharged back into the room through the motor operating chamber.

Conventional vacuum cleaners, however, collect contaminants with the use of a consumable dust filter. When the dust filter is filled with contaminants, the dust filter must be replaced manually. Manual replacement of a dust filter is inconvenient and can result in poor sanitation conditions.

It is an object of the present invention to provide a vacuum cleaner with cyclone dust collecting apparatus for centrifuging and collecting contaminants from the air drawn into the vacuum cleaner through a suction brush.

According to one aspect of the invention, an upright-type vacuum cleaner comprises: a cleaner body including a dust collecting chamber having an air intake port and an air discharge port, a motor chamber, and an air discharge path providing communication between the dust collecting chamber and the motor chamber; a suction brush pivotally

connected to the cleaner body for drawing air and contaminants into the cleaner by a suction force generated by a motor in the motor chamber; cyclone dust collecting means detachably mounted in the dust collecting chamber and configured to induce the air and contaminants into a vortex, thereby separating by centrifugal force larger particle contaminants from the air and collecting the separated contaminants; and filtering means removably disposed in the air discharge path for filtering out fine contaminants from the air which flows from the cyclone dust collecting means into the motor chamber.

According to another aspect of the invention, the cyclone dust collecting means include a cyclone body having a centrifuging body for inducing the air and contaminants that are drawn into an upper open end of the cyclone body into a vortex and separating the contaminants from the air by centrifugal force. The cyclone dust collecting means further includes a dust receptacle for collecting and storing the separated contaminants, and a cover removably coupled to the open upper end of the cyclone body. The cover includes an air intake channel and an air discharge channel. The air intake channel communicates with the air intake port of the dust collecting chamber, and the air discharge channel communicates with the air discharge port.

The filtering means preferably includes a filter and a filter case. The filter case may be detachably disposed between the dust collecting chamber and the motor chamber to receive the filter and has an opening in communication with the air discharge path, and vents in communication with the motor operating chamber.

The invention will now be described by way of example with reference to the drawings, in which:

Figure 1 is a partially exploded perspective view of an upright-type vacuum cleaner in accordance with the invention, having a cyclone dust collecting device;

Figure 2 is a perspective view of the dust collecting device of Figure 1; and

Figure 3 is a sectional view of part of the cleaner of Figure 1 in an assembled state.

Referring to Figure 1, an upright-type vacuum cleaner includes a cleaner body 10, a suction brush 20 pivotally connected to a lower portion of the cleaner body 10, a cyclone dust collecting device 30 removably mounted in the cleaner body 10, and a filtering device 40 for filtering fine contaminants.

The cleaner body 10 has a dust collecting chamber 11 in which the cyclone dust collecting device 20 is mounted, a motor chamber 12 in which a motor (not shown) is installed, and a filtering chamber 13 in which the filtering device 40 is removably mounted. The dust collecting chamber 11 has an air intake port 11a and an air discharge port 11b, the air intake port 11a communicating with the suction brush 20 through an air intake path 14 disposed in the cleaner body 10, and the air discharge port 11b communicating with the motor chamber 12 via an air discharge path 15 also disposed in the cleaner body 10. Accordingly, contaminants entrained in the air that is drawn in through the suction brush 20 are drawn into the air intake port 11a via the air intake path 14. The air discharge path 15 communicates with the motor chamber 12 through the filtering chamber 13. Accordingly, the air is discharged through the air discharge port 11b, air discharge path 15, the filtering chamber 13, the motor chamber 12, and into the ambient atmosphere. The filtering chamber 13 has an air inlet 13a that corresponds to the air discharge path 15 and air outlets 13b that correspond to the motor operating chamber 12. The air inlet 13a is formed in a side of the filtering chamber 13, and the air outlets 13b are formed in the bottom of the filtering chamber. A front cover 16 is detachably disposed in front of the cleaner body 10 for opening and closing the dust collecting chamber 11 and the filtering chamber 13.

The suction brush moves along the cleaning surface during the cleaning process and draws into the cleaner air and contaminants, such as dust or dirt, by a suction force generated by the motor in the motor chamber 12.

Referring to Figure 2, the cyclone dust collecting device 30 includes a cyclone body 31 and a cover 35 removably coupled to the cyclone body 31. The cyclone body 31 has a centrifuging portion 30a and a contaminants receiving portion 30b.

The centrifuging portion 30a has a cylindrical centrifuging body 32. The contaminants receiving portion 30b has a dust receptacle 33 that is disposed next to the centrifuging body 32. The centrifuging body 32 has an open upper end, a base 32a, and a cylindrical wall 32b. The cylindrical wall 32b extends from the base 32a to the open upper end. The centrifuging body 32 further includes a dust discharge port 32c that is formed at a lower portion of the cylindrical wall 32b.

In operation, air is drawn from the upper end of the centrifuging body 32, together with contaminants and induced into a vortex along the cylindrical wall 32b. The contaminants are then separated from the air by centrifugal force and discharged through the dust discharge hole 32c to the dust receptacle 33. The dust receptacle 33 surrounds the base 32a and the cylindrical wall 32b of the centrifuging body 32. Here, the bottom wall 33a of the dust receptacle 33 and the base 32a of the centrifuging body 32 are spaced apart by a predetermined distance. The contaminants that are discharged through the dust discharge hole 32c accumulate on the bottom wall 33a of the dust receptacle 33 and do not return to the centrifuging body 32. It is preferable that the centrifuging body 32 and the dust receptacle 33 are made of a transparent plastic material to facilitate monitoring of the level of contaminants in the cyclone body 31. It is further preferable that the centrifuging body 32 and dust receptacle 33 are integrally formed. A handle 34 is disposed on an outer circumference of the cyclone body 31 to facilitate easier handling of the cyclone body 31.

The cover 35 of the cyclone dust collecting device 30 has an air intake channel 36 which corresponds to the air intake port 11a, and an air discharge channel 37 which corresponds to the air discharge port 11b.

As air is drawn through the air intake port 11a, it is diagonally guided by the air intake channel 36 to the centrifuging portion 30a. In the centrifuging portion 30a, larger

particle contaminants are removed from the air, and the cleaner air is discharged through the air discharge channel 37. The air discharge channel 37 is disposed at the centre of the cover 35, thereby corresponding approximately to a central portion of the centrifuging portion 30a. It is preferable that the air intake channel 36 has a larger diameter than that of the air discharge channel 37, since the air flowing through the air intake channel 36 contains contaminants, while the cleaner air flowing through the air discharge channel 37 does not.

A grille 38, which communicates with the air discharge channel 37, is disposed on the cover 35 to filter contaminants. The grille 38 has a predetermined height and extends from the lower surface of the cover 35 into the centrifuging portion 30a. The grille has a plurality of through holes 38a formed therein for filtering large particles of contaminants.

Referring to Figures 1 and 3, the filtering device 40 will now be described. The filtering device 40 has a filter 41 and a filter case 43. The filter 41 has a plurality of fine through holes for filtering fine contaminants that were not collected in the cyclone dust collecting device 30. The filter 41 is widely used in conventional vacuum cleaners, and, thus, a detailed description of the filter 41 will be omitted. The filter case 43 in which the filter 41 is inserted, is detachably disposed in the filtering chamber 13. The filter case 43 has an opening 43a, which corresponds to the air inlet 13a. The air inlet 13a in turn communicates with the air discharge path 15. The filter case 43 further includes vents 43b, which correspond to the air outlets 13b leading to the motor chamber 12.

Operation of the cleaner will now be described.

When the motor of the motor chamber 12 operates, a suction force is generated at the suction brush 20. Air along with contaminants on the cleaning surface are drawn into the cyclone dust collecting device 30 through the suction brush 20 and air intake path 14 by the suction force. In the cyclone body 31 of the cyclone dust collecting device, the air intake channel 36 of the cover 35 guides the air and induces it into a vortex

along the interior of the centrifuging body 32. As a result, larger particles of contaminants are separated from the air by centrifugal force and are discharged through the dust discharge hole 32c. The discharged contaminants are collected and stored at the bottom 33a of the dust receptacle 33. Since the centrifuging body 32 is located above the dust receptacle 33, contaminants in the dust receptacle 33 cannot return to the centrifuging body 32 through the dust discharge hole 32c.

The cleaner air, from which the larger particle contaminants have been removed, is discharged from the centrifuging body 32 through the through holes 38a of the grille 38 and the air discharge channel 37. The cleaner air proceeds through the air discharge path 15 to the filter case 43 of the filtering device 13. There, fine contaminants which were not collected in the cyclone dust collecting device 30 are removed from the air by the filter 41. The filtered air is then discharged through the motor chamber 12 back into the environment.

Improved dust collecting efficiency results from first collecting larger particle contaminants with the cyclone dust collecting device 30 and then collecting fine contaminants with the filter 41.

In addition, since the contaminants that have been separated from the air in the cyclone dust collecting device 30 are collected in the dust receptacle 33, backflow of the contaminants is prevented, resulting in a high dust collecting efficiency.

When the dust receptacle 33 is filled with contaminants, the front cover 16 may be detached from the cleaner body 10 to provide access to the cyclone dust collecting device 30. The cyclone dust collecting device 30 can be detached from the dust collecting chamber 11, and the cover 35 removed from the cyclone body 31, exposing the open upper end of the cyclone body 31. When the cyclone body 31 is turned upside down, the contaminants in the dust receptacle 33 may be removed. The cyclone dust collecting device 30 is then re-assembled and mounted in the dust collecting chamber 11 for use.

When the filter 41 is filled with fine contaminants, the filter case 41 is detached from the filtering chamber 13, the filter 41 is removed from the filter case 41, and the fine contaminants are shaken off of the filter 41. The filter 41 and filter case 41 are then re-assembled and mounted in the dust collecting chamber 11. Alternatively, the filter 41 may be replaced with a new filter when it is filled with fine contaminants.

Since the cyclone dust collecting device 30 collects contaminants using a dust receptacle 33 disposed below the centrifuging body 32, contaminants do not return from the dust receptacle 33 to the centrifuging body 32.

Also, since the cyclone dust collecting device 30 initially collects large particles of contaminants, and the filtering device 40 later collects fine contaminants, the dust collecting efficiency of the vacuum cleaner is enhanced.

CLAIMS

1. An upright-type vacuum cleaner comprising:

a cleaner body including:

a dust collecting chamber having an air intake port and an air discharge port;

a motor operating chamber; and

an air discharge path for connecting the dust collecting chamber with the motor operating chamber;

a suction brush connected to the cleaner body for drawing air and contaminants into the cleaner body;

cyclone dust collecting means detachably mounted in the dust collecting chamber, the cyclone dust collecting means being configured to induce the air and contaminants into a vortex to separate larger particle contaminants from the air and collect the separated contaminants; and

filtering means removably disposed in the air discharge path, for removing fine contaminants from the air.

2. A cleaner according to claim 1, wherein the cyclone dust collecting means comprise:

a cyclone body having an open upper end and including a centrifuging body and a dust receptacle, the centrifuging body being configured to induce air and contaminants into a vortex and to separate the contaminants from the air, the dust receptacle being configured to collect and store the separated contaminants; and

a cover removably coupled to the open upper end of the cyclone body and including an air intake channel and an air discharge channel, the air intake channel communicating with the air intake port of the dust collecting chamber, and the air discharge channel communicating with the air discharge port.

3. A cleaner according to claim 2, wherein the centrifuging body has an open upper end, a base, and a cylindrical wall, the cylindrical wall having a dust

discharge hole formed therein, and wherein the dust receptacle abuts at least a portion of the cylindrical wall and the base of the centrifuging body.

4. A cleaner according to claim 2 or claim 3, wherein the air intake path has a diameter which is larger than a diameter of the air discharge path.

5. A cleaner according to any of claims 2 to 4, wherein the cover includes a grille which extends downwardly from the cover into an upper portion of the centrifuging body and which has a plurality of through holes formed therein, the through holes communicating with the air discharge path.

6. A cleaner according to any preceding claim, wherein the cleaner body further includes a filtering chamber, the filtering means being removably mounted in the filtering chamber, which filtering chamber is located between the dust collecting chamber and the motor operating chamber and has an air inlet in communication with the air discharge path and at least one air outlet in communication with the motor operating chamber.

7. A cleaner according to any preceding claim, wherein the filtering means comprises a filter and a filter case detachably disposed between the dust collecting chamber and the motor operating chamber for receiving the filter, the filter case having an opening in communication with the air discharge path, and a vent in communication with the motor operating chamber.

8. A cleaner according to claim 6, wherein the filtering means comprises a filter and a filter case detachably disposed in the filtering chamber, the filter case having an opening corresponding to the air inlet, and a vent corresponding to the at least one air outlet.

9. An upright-type vacuum cleaner constructed and arranged substantially as herein described and shown in the drawings.

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Application No: GB 0104873.5 **Examiner:** Kathryn Orme
Claims searched: 1 - 9 **Date of search:** 4 April 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): A4F (FFD), B2P

Int Cl (Ed.7): A47L 09/16, B04C

Other: Online: WPI, EPODOC, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2321181 A	(ELECTROLUX) see especially fig 5 and page 10 line 10 to page 11 line 7	1 and 2
X	WO 99/34722	(ROYAL APPLIANCE) see especially page 16 line 14 to page 17 line 8 and fig 8	1
X	US 5779745	(KILSTROM) see especially filter 51 and fig 4	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	B	Patent document published on or after, but with priority date earlier than, the filing date of this application.